

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A ~~subscriber for indicating liveness to a broker in a~~ multicast publish/subscribe messaging system comprising ~~[[the]]~~ a broker and a plurality of subscribers, the ~~subscriber system~~ comprising:

a subscriber of the plurality of subscribers including a liveness indicator for indicating liveness to the broker, the liveness indicator comprising:

setting means, responsive to the subscriber seeing ~~[[an]]~~ a first indication of liveness, for setting a timer;

cancelling means, responsive to the subscriber seeing a second indication of liveness from another subscriber of the plurality of subscribers prior to expiry of the timer, for cancelling the timer if the subscriber sees an indication of liveness prior to the expiry of the timer; and

sending means, ~~for sending, on~~ responsive to expiry of the timer, for the subscriber to send a third ~~[[an]]~~ indication of liveness to the broker.

2. (Currently amended) The ~~subscriber system~~ of claim 1, wherein the sending means ~~for sending an indication of liveness~~ comprises:

means for multicasting a claim that the subscriber proposes to send an indication of ~~[[its]]~~ the subscriber's presence to the broker; and

means for sending a presence indication to the broker.

3. (Currently amended) The ~~subscriber system~~ of claim 2, wherein the first indication of liveness ~~responsive to which the timer is set~~ is a claim sent to the broker.

4. (Currently amended) The ~~subscriber system~~ of claim 1, wherein the cancelling means ~~for cancelling the timer~~ comprises:

means for determining at least one of:

i) if a desired number of subscribers of the plurality of subscribers have indicated liveness, and

ii) that the broker is aware of the presence of at least one subscriber; and

means, responsive to determining that at least one of a desired number of subscribers of the plurality of subscribers have indicated liveness ~~and/or~~ and that the broker is aware of the presence of at least one subscriber, for cancelling the timer.

5. (Currently amended) The ~~subscriber system~~ of claim 4, further comprising:

means for receiving and storing a max value, wherein the max value ~~[[being]]~~ is representative of the desired number of subscribers.

6. (Currently amended) The ~~subscriber system~~ of claim 1, wherein ~~in operation~~ an active connection is maintained between the broker and the subscriber in the multicast publish/subscribe messaging system ~~is maintained~~, the subscriber further comprising:

means for using the active connection to send an indication of ~~[[its]]~~ the subscriber's presence to the broker.

7. (Currently amended) The ~~subscriber system~~ of claim 6, wherein the active connection is a TCP connection.

8. (Currently amended) The ~~subscriber system~~ of claim 1, wherein at least one of the first indication of liveness, the second indication of liveness and the third indication of liveness is piggybacked onto another message.

9. (Currently amended) The ~~subscriber system~~ of claim 1, wherein at least one of the first indication of liveness, the second indication of liveness and the third indication of liveness is sent over one of:

a UDP connection; and

a TCP connection.

10. (Currently amended) The ~~subscriber system~~ of claim 1, further comprising:

receiving means for receiving an indication from the broker that the broker is aware of the presence of at least one subscriber of the plurality of subscribers.

11. (Currently amended) ~~A broker for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in~~ The system of claim 1, wherein the broker is operable to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the broker comprising:

means for determining which subscribers of the plurality of subscribers have an active connection to the broker; and

means for informing ~~a subscriber~~ subscribers of the plurality of subscribers that have an active connection to the broker to that they should set ~~that they should set~~ [[a]] their timer only if that subscriber has an active connection to the broker.

12. (Currently amended) ~~A broker for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in~~ The system of claim 1, wherein the broker is operable to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the broker comprising:

means for determining which subscribers of the plurality of subscribers have an active connection to the broker; and

means for informing ~~such active~~ subscribers determined to have an active connection to the broker that their timer should be set to run for less than a predetermined amount.

13. (Currently amended) ~~The broker system of claim 11~~, the broker comprising:

means for designating as a primary subscriber ~~[[the]]~~ a first subscriber of the plurality of subscribers to register interest in a topic; and

means for maintaining an active connection to the primary subscriber.

14. (Currently amended) ~~The broker system of claim 13~~, comprising:

means, responsive to a for, in the event of failure of the primary subscriber, for designating ~~[[as]]~~ a new primary subscriber ~~the subscriber of the plurality of subscribers~~ whose indication of liveness is next received as a new primary subscriber.

15. (Currently amended) ~~The broker system of claim 13~~ comprising:

means for informing at least the primary subscriber that ~~[[it]]~~ the primary subscriber is responsible for periodically indicating liveness to the broker.

16. (Currently amended) ~~A broker The system of for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in claim 1, wherein the broker comprises comprising:~~

means for listening in on a multicast channel, used by the plurality of subscribers, ~~in order to receive any~~ for receiving indications of liveness from any of said plurality of subscribers.

17. (Currently amended) A method for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the method comprising:

responsive to seeing ~~[[an]]~~ a first indication of liveness at a subscriber, setting a timer;

responsive to the subscriber seeing a second indication of liveness from another subscriber of the plurality of subscribers prior to the expiry of the timer, cancelling the timer ~~if the subscriber sees an indication of liveness prior to the expiry of the timer~~; and

responsive to expiry of the timer, the subscriber sending, on expiry of the timer, an a third indication of liveness to the broker.

18. (Currently amended) The method of claim 17, wherein the sending step ~~of sending an indication of liveness~~ comprises:

multicasting a claim that the subscriber proposes to send an indication of ~~[[its]]~~ the subscriber's presence to the broker; and

sending a presence indication to the broker.

19. (Currently amended) The method of claim 18, wherein the first indication of liveness ~~responsive to which the timer is set~~ is a claim.

20. (Currently amended) The method of claim 17, wherein the cancelling step ~~of cancelling the timer~~ comprises:

determining at least one of:

i) if a desired number of subscribers of the plurality of subscribers have indicated liveness, and

ii) that the broker is aware of the presence of at least one subscriber; and

responsive to determining that at least one of a desired number of subscribers of the plurality of subscribers have indicated liveness and ~~and/or~~ that the broker is aware of the presence of at least one subscriber, cancelling the timer.

21. (Currently amended) The method of claim 20, further comprising ~~the steps of~~:

receiving and storing a max value, wherein the max value ~~[[being]]~~ is representative of the desired number of subscribers.

22. (Currently amended) The method of claim 17, wherein the broker is operable to maintain at least one active connection between ~~itself the broker and~~ at least one subscriber of the plurality of subscribers, the method further comprising:

using one ~~[[such]]~~ of the at least one active connection to send an indication of a subscriber's presence to the broker.

23. (Original) The method of claim 22, wherein the active connection is a TCP connection.

24. (Currently amended) The method of claim 17, wherein at least one of the first indication of liveness, the second indication of liveness and the third indication of liveness is piggybacked onto another message.

25. (Currently amended) The method of claim 17, wherein at least one of the first indication of liveness, the second indication of liveness and the third indication of liveness is sent over one of:

a UDP connection; and

a TCP connection.

26. (Currently amended) The method of claim 17, comprising:

receiving an indication from the broker that the broker is aware of the presence of at least one subscriber of the plurality of subscribers.

27. (Currently amended) ~~[[A]] The method of for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in claim 1,~~ wherein the broker is operable to maintain at least one active connection between the broker and at least one subscriber of the plurality of subscribers, the method further comprising:

determining which subscribers of the plurality of subscribers have an active connection to the broker; and

~~informing a subscriber~~ subscribers of the plurality of subscribers that have an active connection to the broker to ~~that they should~~ set a timer ~~only if that subscriber has an active connection to the broker.~~

28. (Currently amended) ~~[[A]] The method of for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in claim 1,~~ wherein the broker is operable to maintain at least one active connection between the broker and at least one subscriber , the method further comprising:

determining which subscribers of the plurality of subscribers have an active connection to the broker; and

informing ~~such active~~ subscribers of the plurality of subscribers determined to have an active connection to the broker that their timer should be set to run for less than a predetermined amount.

29. (Currently amended) The method of claim 27 comprising:
designating as a primary subscriber ~~[[the]]~~ a first subscriber of the plurality of subscribers to register interest in a topic; and
maintaining an active connection to the primary subscriber.

30. (Currently amended) The method of claim 29 comprising:
~~in the event of~~ responsive to a failure of the primary subscriber, designating ~~[[as]]~~ a new primary subscriber of the plurality of subscribers ~~the subscriber~~ whose indication of liveness is next received as a new primary subscriber.

31. (Currently amended) The method of claim 29 comprising:
informing at least the primary subscriber that ~~[[it]]~~ the primary subscriber is responsible for periodically indicating liveness to the broker.

32. (Currently amended) ~~[[A]]~~ The method of for liveness monitoring in a multicast publish/subscribe messaging system comprising a plurality of subscribers as claimed in claim 1, the method further comprising:

listening in on a multicast channel, used by the plurality of subscribers, ~~in order to receive any~~ for receiving indications of liveness from any of said plurality of subscribers.

33. (Currently amended) A computer program element in a data carrier for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the computer program element comprising program code means ~~adapted~~ to perform ~~[[the]]~~ steps of:

responsive to seeing ~~[[an]]~~ a first indication of liveness at a subscriber, setting a timer;
responsive to the subscriber seeing a second indication of liveness from another subscriber of the plurality of subscribers prior to expiry of the timer, cancelling the timer ~~if the subscriber sees an indication of liveness prior to the expiry of the timer~~; and

responsive to expiry of the timer, the subscriber sending, on expiry of the timer, an a third
indication of liveness to the broker.